

CLAIMS

1. Process for the manufacture of chicory inulin from chicory roots by conventional manufacturing techniques, wherein the source material for the process are roots of chicory which have been grown in appropriate regions and grown and processed under proper climatological temperature conditions which are such that during a period of at least from the beginning of the third month of the growing period till the end of the processing of the chicory roots the FEH gene in the chicory roots has not been triggered by the occurrence of low temperature conditions, said chicory roots have had a growing period of at least 150 days, and said chicory has been seeded in the northern hemisphere within a period selected from the periods ranging from December 1 till March 14, from May 15 till May 31, from June 1 till June 14, and from June 15 till November 30, provided that when said chicory has been seeded in the periods from May 15 till May 31, and from June 1 till June 14, the chicory roots have had a growing period of at least 180 days, or in the southern hemisphere within a period selected from the periods ranging from June 1 till September 14, from September 15 till September 30, from October 1 till November 14, from November 15 till November 30, and from December 1 till May 31.

2. Process according to claim 1, wherein the chicory has had a growing period of at least 180 days.

3. Process according to claim 1 or claim 2 wherein the chicory inulin is standard grade or low sugar standard grade chicory inulin with a (\overline{DP}) of at least 10, improved standard grade or improved low sugar standard grade chicory inulin with a mean (\overline{DP}) of at least 12, high performance grade chicory inulin with a (\overline{DP}) of at least 20, or improved high performance grade chicory inulin with a mean (\overline{DP}) of at least 20, the mean (\overline{DP}) being taken over a processing period of at least 60 days.

4. Process according to claim 3 for the manufacture of improved standard grade chicory inulin, wherein the roots of chicory have been grown and processed under proper climatological temperature conditions wherein, within a period of at least 220 consecutive days immediately preceding the end of the processing of the roots, no low temperature conditions occurred which triggered the FEH gene in chicory roots, said roots have had a growing period of at least 160 days, and the product obtained is improved standard grade chicory inulin with a mean (\overline{DP}) taken over a processing period of at least 60 days, which is at least 12.

PRAFF 26/WO

PCT/EP99/00155

M 12.00.00
AMENDED SHEET

38

5. Process according to claim 4, wherein no low temperature conditions which trigger the FEH gene in chicory roots occur within a total period of at least 240 consecutive days, the chicory has had a growing period of at least 180 days, and the product obtained is improved standard grade chicory inulin with a mean (\overline{DP}), taken over a processing period of at least 60 days, which is at least 12.

6. Process according to claim 4 or claim 5 wherein the chicory has been seeded in the northern hemisphere within a period selected from the periods ranging from December 1 till March 14, from March 15 till May 14, from May 15 till May 31, and from June 1 till November 30, or in the southern hemisphere within a period selected from the periods ranging from June 1 till September 14, from September 15 till November 14, from November 15 till November 30, and from December 1 till May 31.

7. Process according to any of claims 1 to 6 wherein the said proper climatological temperature conditions are such that during the concerned period immediately preceding the end of the processing of the chicory roots the temperature in the temperature shelter has not dropped below minus 1°C.

8. Process according to any of claims 1 to 7 wherein said appropriate regions for growing chicory which present, besides the known conditions for growing chicory, said proper climatological temperature conditions, comprise a region selected from the group consisting of the Californian region of the USA, certain valleys of Chile, and certain maritime regions of Europe, Turkey, Australia, Morocco, Algeria, South Africa, China and India.

9. Process according to any of claims 1 to 8 for the manufacture of standard grade chicory inulin or improved standard grade chicory inulin, comprising the following steps:

(i) isolation of the inulin from the chicory roots yielding an aqueous solution of crude inulin,

(ii) purification of the crude inulin obtained in step (i) yielding an aqueous solution of purified inulin, optionally followed by concentration of this solution by partial removal of the water yielding a purified inulin concentrate, and

(iii) isolation in particulate form of the inulin from the aqueous solution or concentrate of purified inulin obtained in step (ii), thereby yielding, respectively, standard grade chicory inulin or improved standard grade chicory inulin.

PRAFF 26/WO

PCT/EP99/00155

12.02.00
AMENDED SHEET

39

10. Process according to claim 9, comprising:

- for step (i): extraction with hot water of the inulin from fresh slices or shreds of the chicory roots, yielding an aqueous solution of crude inulin,
- for step (ii): purification of the aqueous solution of crude inulin obtained in step (i) by depuration followed by refining, and
- for step (iii): isolation of, respectively, standard grade chicory inulin or improved standard grade chicory inulin, in particulate form by spray drying.

11. Process according to any of claims 1, 2, 3, 7 and 8 for the manufacture of low sugar standard grade chicory inulin or improved low sugar standard grade chicory inulin containing in total less than 1 weight % monomeric saccharides and sucrose, by conventional techniques from chicory roots, wherein the source material are chicory roots which have been grown and processed under the conditions as defined in any of claims 1 to 8.

12. Process according to claim 11, wherein, respectively, standard grade chicory inulin or improved standard grade chicory inulin or the corresponding intermediate purified inulin, obtained by a process defined in any of claims 1 to 10 is used as a source material and is, in accordance with known techniques, subjected to the following additional consecutive steps:

(iv) removal of the monomeric saccharides and sucrose, yielding a low sugar inulin solution or concentrate, and

(v) isolating the low sugar inulin in particulate form from the solution or concentrate obtained in step (iv), and the product obtained is, respectively, low sugar standard grade chicory inulin with a mean (\overline{DP}) of at least 10 or improved low sugar standard grade chicory inulin with a mean (\overline{DP}) of at least 12, the mean (\overline{DP}) being taken over a processing period of at least 60 days.

13. Process according to any of claims 1, 2, 3, 7 and 8, for the manufacture of high performance grade chicory inulin with a (\overline{DP}) of at least 20, or improved high performance grade chicory inulin with a mean (\overline{DP}), taken over a processing period of the chicory roots of at least 60 days, of at least 20, which are essentially free from low molecular monomeric saccharides, dimeric saccharides and oligofructose, and essentially free from colourings, salts, proteins, organic acids and technological aids, wherein the source material are chicory roots which have been grown and processed under the conditions as defined in any of claims 1 to 2, and 4 to 8.

AMENDED SHEET

PRAFF 26/WO

PCT/EP99/00155

11 12 00 00
AMENDED SHEET

40

14. Process according to claim 13, wherein standard grade chicory inulin with a (\overline{DP}) of at least 12, respectively improved standard grade chicory inulin with a mean (\overline{DP}), taken over a processing period of the chicory roots of at least 60 days, of at least 12, or its intermediate, depurated or refined inulin, obtained by a process defined in any of claims 1 to 10, is used as a source material and subjected, in accordance with known techniques, to the following consecutive steps:

(vi) fractionation, and

(vii) isolation in particulate form of the high performance grade inulin from the fractionated product obtained in step (vi), thereby providing high performance grade chicory inulin, respectively improved high performance grade chicory inulin in a yield of at least 40 % based on the source inulin.

15. Process according to claim 14, wherein the fractionation is carried out by directed crystallisation of an aqueous metastable solution of the source material, and the isolation of the fractionated inulin in particulate form is carried out by filtration or centrifuging including washing with water.

16. Process according to any of claims 13 to 15, wherein the source inulin has a (\overline{DP}), respectively a mean (\overline{DP}) of at least 14, and the high performance grade chicory inulin, respectively improved high performance grade chicory inulin, is obtained in a yield of at least 45 % based on the source material, and has a (\overline{DP}), respectively a mean (\overline{DP}), of at least 20, the mean (\overline{DP}) being taken over a processing period of the source chicory roots of at least 60 days.

17. Process for the manufacture of a partial hydrolysate of chicory inulin, by conventional techniques from chicory roots, wherein the source material are chicory roots which have been grown and processed under the conditions as defined in any of claims 1 to 2, and 4 to 8 and the product obtained is a polydisperse oligofructose composition.

18. Process according to claim 17, wherein respectively, standard grade or improved standard grade chicory inulin or the corresponding intermediates, depurated or refined inulin, obtained by a process defined in any of claims 1 to 10, is used as a source material, and the product obtained is a polydisperse oligofructose composition containing at least 90 % by weight dry substance and the oligofructose has a (DP) from 2 to 10.

19. Process for the manufacture of a complete hydrolysate of chicory inulin, by conventional techniques from chicory roots, wherein the source

PRAFF 26/WO

PCT/EP99/00155

N 12.02.00
AMENDED SHEET

41

material are chicory roots which have been grown and processed under the conditions as defined in any of claims 1 to 2, and 4 to 8, and the product obtained is a fructose composition.

20. Process according to claim 19, wherein, respectively, standard
5 grade or improved standard grade inulin or the corresponding intermediate, depurated or refined inulin, obtained by a process defined in any of claims 1 to 10, is used as a source material, and the product obtained is a fructose composition containing at least 89 % by weight fructose, calculated on dry substance.

10 21. Process for the manufacture of a derivative of chicory inulin, by conventional techniques from chicory inulin or an intermediate thereof, wherein the source material for the inulin are chicory roots which have been grown and processed under the conditions as defined in any of claims 1 to 2, and 4 to 8.

15 22. Improved standard grade chicory inulin with an inulin content, expressed on dry matter, of at least 92% by weight, and a maximal total content of glucose, fructose and sucrose of 8 % by weight, characterised in that the inulin has a mean (\overline{DP}) taken over a processing period of the source chicory roots of at least 60 days, of at least 12, obtainable by a process according to any of claims 1 to 10.

20 23. Improved low sugar standard grade chicory inulin with, expressed on dry matter, an inulin content of more than 99% by weight, and a total content of glucose, fructose and sucrose of less than 1% by weight, characterised in that the inulin has a mean (\overline{DP}) taken over a processing period of the source chicory roots of at least 60 days, of at least 12, obtainable by a process according to any
25 of claims 1 to 3 and 11 to 12.

24. Improved high performance grade chicory inulin which is essentially free from low molecular monomeric saccharides, dimeric saccharides and oligofructose, and essentially free from colourings, salts, proteins, organic acids and technological aids, with a mean (\overline{DP}), taken over a processing period
30 of the source chicory roots of at least 60 days, of at least 20, obtainable by a process according to any of claims 1 to 3 and 13 to 16.

25. Improved polydisperse oligofructose composition containing at least 90 % by weight dry substance and wherein the oligofructose has a (DP) from 2 to 10, obtained by a process according to claim 17 or 18.

35 26. Improved fructose composition containing at least 89 % by weight of fructose and having a ratio fructose/glucose of at least 90/10, obtained by a process according to claim 19 or 20.

PRAFF 26/WO

PCT/EP99/00155

11 12.02.00

AMENDED SHEET

42

27. Method of use of roots of chicory as a source material in a process for the manufacture of chicory inulin, of a partial or a complete hydrolysate of inulin, or a derivative of inulin, characterised in that the roots have been grown in appropriate regions and grown and processed under proper climatological temperature conditions as defined in any of claims 1 to 2 with optionally a processing period of said roots of at least 60 days adjacent to the growing period, as well as under the conditions defined in any of claims 4 to 8.

28. Method of use of improved standard grade chicory inulin, improved low sugar standard grade chicory inulin, improved high performance grade chicory inulin, an improved polydisperse oligofructose composition or an improved fructose composition, as defined in any of claims 22 to 26, as an ingredient in the manufacture of food, feed, drinks, a prophylactic or a therapeutic composition, or a non-food composition.

15

H100

033

AMENDED SHEET